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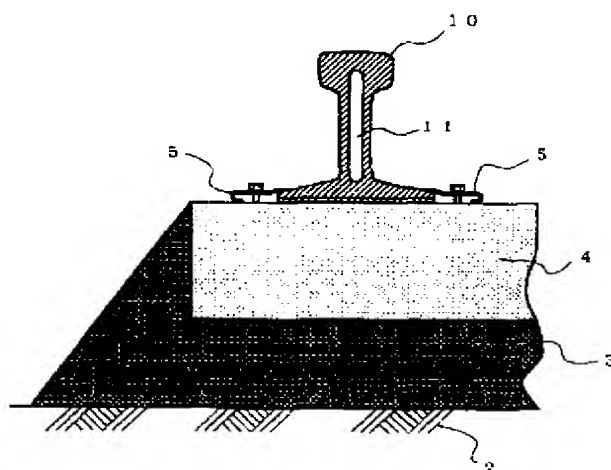
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(54) 【発明の名称】 鉄道用レールおよび鉄道用軌道

(57) 【要約】

【課題】 本発明は、曲げ剛性を高めつつ軸応力を低減し、かつ、低騒音の鉄道用レールおよび鉄道用軌道を提供することを目的とする。

【解決手段】 鉄道車両の車輪を直接支持・案内する鉄道用レール 1 0 であって、内部に、冷却液が送り込まれる中空部 1 1 が長さ方向に沿って形成されていることを特徴とする。



# 【特許請求の範囲】

【請求項1】 鉄道車両の車輪を直接支持・案内する鉄道用レールであって、内部に、冷却液が送り込まれる中空部が長さ方向に沿って形成されていることを特徴とする鉄道用レール。

【請求項2】 前記中空部が、レールの長さ方向と直交する面方向に間隔をおいて複数形成されていることを特徴とする請求項1に記載の鉄道用レール。

【請求項3】 前記中空部がレールの全長にわたって設けられ、長さ方向に敷設される一対のレールの継ぎ目において、各レールの中空部に嵌合させられることにより、前記各レールの中空部の端部を閉塞するとともに、これら一対のレールを継ぎ合わせる連結部材が設けられていることを特徴とする請求項1または請求項2に記載の鉄道用レール。

【請求項4】 内部に、冷却液が送り込まれる中空部が長さ方向に沿って形成された鉄道用レールに、このレールの長さ方向に離間した複数箇所に装着されるとともに、前記中空部へ連通させられた給排水管と、これらの給排水管の間に設けられ、前記中空部へ冷却液を送り込む冷却ポンプとを備えた冷却装置が設けられていることを特徴とする鉄道用軌道。

【請求項5】 前記冷却装置が、前記レールとともに前記冷却液の閉回路を構成し、この閉回路の途中に、前記冷却液の冷却をなす熱交換器が設けられていることを特徴とする請求項4に記載の鉄道用軌道。

【請求項6】 前記中空部がレールの全長にわたって設けられ、長さ方向に敷設される一対のレールの継ぎ目において、各レールの中空部に嵌合させられることにより、前記各レールの中空部の端部を閉塞するとともに、これら一対のレールを継ぎ合わせる連結部材が設けられていることを特徴とする請求項4または請求項5に記載の鉄道用軌道。

# 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、鉄道用レールおよび鉄道用軌道に係わり、特に、曲げ剛性に優れた鉄道用レールおよび鉄道用軌道に関するものである。

## 【0002】

【従来の技術】従来の鉄道用レールおよび鉄道用軌道として、たとえば、図5および図6に示す構造のものが知られている。

【0003】図中、符号1で示すレールは平底レールと称されるもので、路盤2上に道床3を介して支持された複数のまくらぎ4に、架け渡されるように敷設され、これらのまくらぎ4に、締結装置5によって固定されることによって、図6に示すように鉄道用軌道6を構成するようになっている。

## 【0004】

【発明が解決しようとする課題】ところで、このような

従来の鉄道用軌道6にあっては、まくらぎ4で不連続に支持されている構造であることから、レール1の曲げも不連続であり、まくらぎ4の下のだ床3や路盤2への荷重が、まくらぎ4の直下に集中しやすく、軌道6の沈下の原因となっている。

【0005】このような不具合へ対処するための一手段として、前記レール1の断面積を大きくして、その曲げ剛性を高めることが考えられる。しかしながら、このような断面形状の拡大によって曲げ剛性を向上させた場合、つぎのような新たな不具合が発生する。

【0006】すなわち、炎天下にさらされるレール1は、その温度上昇により長さ方向に伸びるが、熱膨張によるレール1の両端部の移動量が規制されていることから、前述した温度上昇に伴って軸応力が発生し、高温時において、図6に鎖線で示すように、レール1に座屈を生じることが考えられる。この現象は、特に、レール1の端体の長さが長く、継ぎ目の少ないロングレールにおいて顕著となることが想定される。

【0007】また、前述したように断面形状を大きくして曲げ剛性を高めると、車輪7の転動による騒音レベルが大きくなるという問題点もある。

【0008】本発明は、このような従来の問題点を鑑みてなされたもので、曲げ剛性を高めつつ軸応力を低減し、かつ、低騒音の鉄道用レールおよび鉄道用軌道を提供することを目的とする。

## 【0009】

【課題を解決するための手段】本発明の請求項1に記載の鉄道用レールは、前述した目的を達成するために、鉄道車両の車輪を直接支持・案内する鉄道用レールであって、内部に、冷却液が送り込まれる中空部が長さ方向に沿って形成されていることを特徴とする。本発明の請求項2に記載の鉄道用レールは、請求項1に記載の前記中空部が、レールの長さ方向と直交する面方向に間隔をおいて複数形成されていることを特徴とする。本発明の請求項3に記載の鉄道用レールは、請求項1または請求項2に記載の前記中空部がレールの全長にわたって設けられ、長さ方向に敷設される一対のレールの継ぎ目において、各レールの中空部に嵌合させられることにより、前記各レールの中空部の端部を閉塞するとともに、これら一対のレールを継ぎ合わせる連結部材が設けられていることを特徴とする。本発明の請求項4に記載の鉄道用軌道は、内部に、冷却液が送り込まれる中空部が長さ方向に沿って形成された鉄道用レールに、このレールの長さ方向に離間した複数箇所に装着されるとともに、前記中空部へ連通させられた給排水管と、これらの給排水管の間に設けられ、前記中空部へ冷却液を送り込む冷却ポンプとを備えた冷却装置が設けられていることを特徴とする。本発明の請求項5に記載の鉄道用軌道は、請求項4に記載の前記冷却装置が、前記レールとともに前記冷却液の閉回路を構成し、この閉回路の途中に、前記冷却液



で、炎天下において鉄道用レールの温度が上昇し、軸応力が発生しようとした際に、その内部に形成されている中空部に、水等の冷却液を流すことによって前述した温度上昇を抑制することができる。これによって鉄道用レールの温度を所定の温度以下に保持することにより、温度上昇に伴って生じる軸応力を小さく抑えることができるので、その分、鉄道用レールの断面二次モーメントを大きくして、その曲げ剛性を高めることができる。また、鉄道用レールの内部に冷却液が存在することにより、鉄道用レールの振動の高周波成分を前記冷却液によって吸収し、この点からも、騒音低減効果を高めることができる。

【図面の簡単な説明】

【図1】本発明に係わる鉄道用レールを示すもので、一実施形態を敷設した状態を示す縦断面図である。

【図2】本発明の一実施形態を示すもので、鉄道用レールの継ぎ目構造を示す一部を破断した側面図である。

【図3】本発明の他の実施形態を示す縦断面図である。

【図4】本発明に係わる鉄道用軌道の一実施形態を示す概略平面図である。

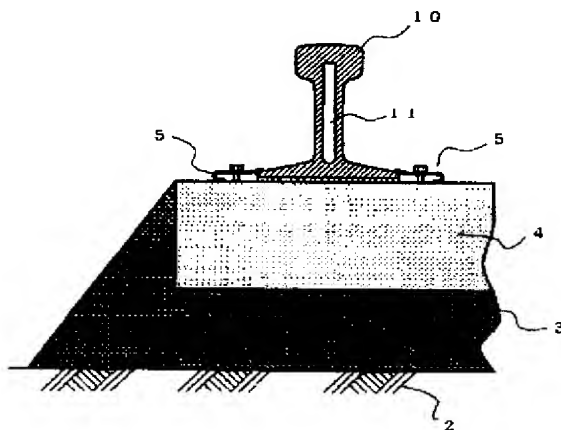
【図5】一従来例を示す縦断面図である。

【図6】一般的な鉄道用軌道における高温下での鉄道用レールの挙動を説明するための概略図である。

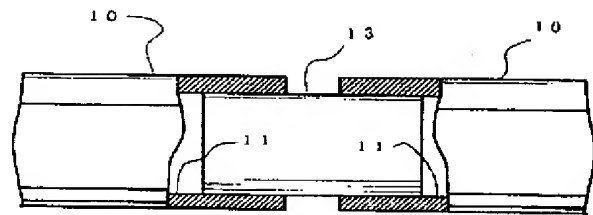
【符号の説明】

- 1 レール
- 2 路盤
- 3 道床
- 4 まくらぎ
- 5 締結装置
- 6 鉄道用軌道
- 10 鉄道用レール
- 11 中空部
- 13 連結部材
- 16 冷却装置
- 17 鉄道用軌道
- 18 給排水管
- 19 冷却ポンプ
- 20 熱交換器
- 21 温度センサ
- 22 制御ユニット

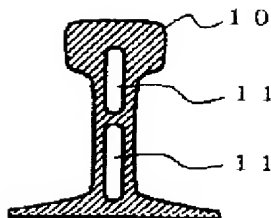
【図1】



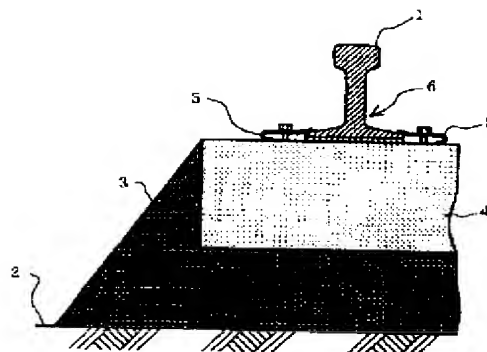
【図2】



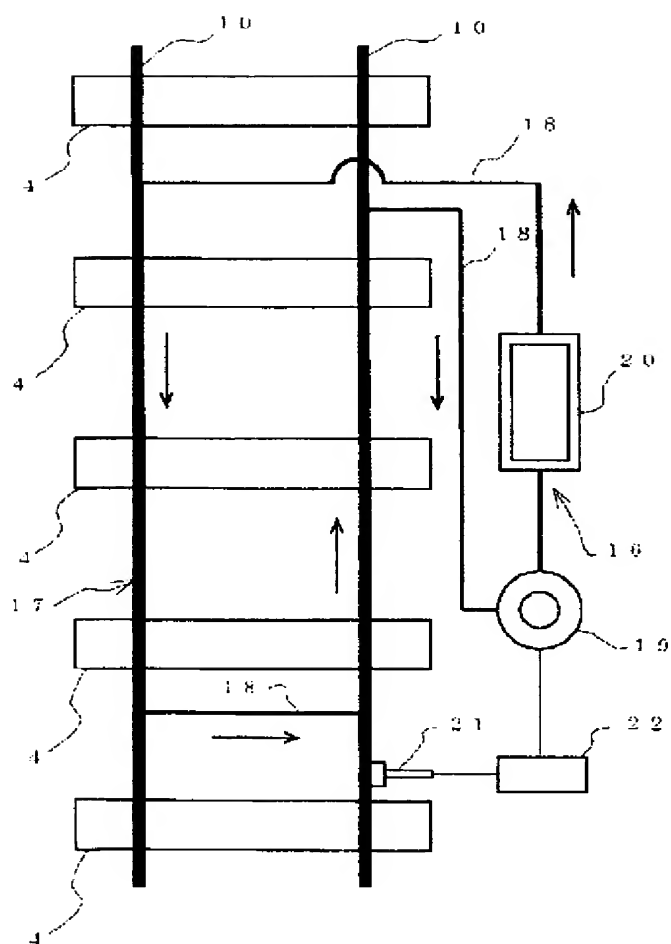
【図3】



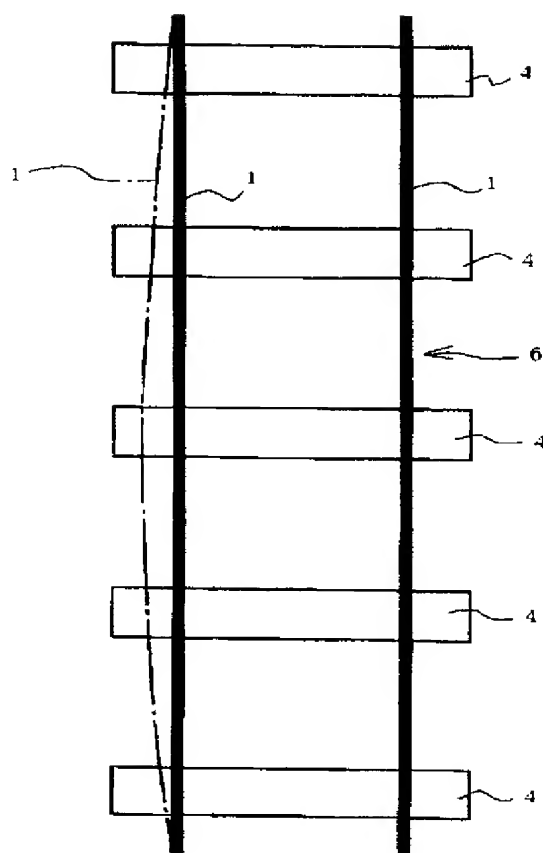
【図5】



【圖4】



【圖6】



# PATENT ABSTRACTS OF JAPAN

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RES INST

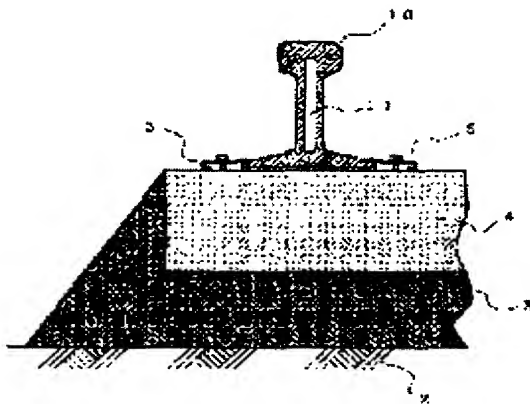
(22)Date of filing : 16.11.1999 (72)Inventor : MURAMOTO KATSUMI

## (54) RAILWAY RAIL AND RAILWAY TRACK

(57)Abstract:

PROBLEM TO BE SOLVED: To provide the railway rail and the railway track of low noise reducing axial stress while enhancing bending rigidity.

SOLUTION: On the railway rail 10 directly supporting and guiding the wheels of a rolling stock, a hollow part 11 in which a cooling liquid is supplied in the inside is formed along the length direction.



## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the rail for railroads and the orbit for railroads excellent in flexural rigidity with respect to the rail for railroads, and the orbit for railroads.

[0002]

[Description of the Prior Art] As the conventional rail for railroads and the conventional orbit for railroads, the thing of the structure shown in drawing 5 and drawing 6 is known.

[0003] Among drawing, when it is called a flanged rail, it is laid by two or more  
\*\*\*\*\* 4 supported through ballast 3 on the base course 2 so that it may be

built, and it is fixed to them by these \*\*\*\*\* 4 with a fastener 5, the rail shown with a sign 1 constitutes the orbit 6 for railroads, as shown in drawing 6 .

[0004]

[Problem(s) to be Solved by the Invention] By the way, if it is in such a conventional orbit 6 for railroads, since it is the structure currently supported by discontinuity by \*\*\*\*\* 4, bending of a rail 1 is also discontinuous, it is easy to concentrate the load to the ballast 3 and the base course 2 under \*\*\*\*\* 4 directly under \*\*\*\*\* 4, and it causes [ of the orbit 6 ] subsidence.

[0005] It is possible to enlarge the cross section of said rail 1 and to raise the flexural rigidity as a way stage for coping with such fault. However, when raising flexural rigidity by expansion of such a cross-section configuration, the following new faults occur.

[0006] That is, although the rail 1 exposed to a flame world is extended in the die-length direction by the temperature rise, in connection with the temperature rise mentioned above, axial stress occurs from the movement magnitude of the both ends of the rail 1 by thermal expansion being regulated, and as the chain line shows, it can consider producing a buckling on a rail 1 to drawing 6 at the time of an elevated temperature. Especially this phenomenon has the long die length of the apotele of a rail 1, and becoming remarkable in a long welded rail with few joints is assumed.

[0007] Moreover, as mentioned above, when a cross-section configuration is enlarged and flexural rigidity is raised, there is also a trouble that the noise level by the rolling motion of a wheel 7 becomes large.

[0008] This invention was made in view of such a conventional trouble, and it aims at reducing axial stress and offering the rail for railroads and the orbit for railroads of the low noise, raising flexural rigidity.

[0009]

[Means for Solving the Problem] In order to attain the purpose mentioned above, the rail for railroads of this invention according to claim 1 is a rail for railroads which guides [ which guides and direct-supports ] the wheel of a rail car, and is characterized by forming the centrum by which the coolant is sent into the interior along the die-length direction. The rail for railroads of this invention according to claim 2 is characterized by for said centrum according to claim 1 setting spacing in the direction of a field which intersects perpendicularly with the die-length direction of a rail, and two or more formation being carried out. The rail for railroads of this invention according to claim 3 is characterized by preparing the connection member which joins the rail of these pairs together while it blockades the edge of the centrum of each of said rail by preparing said centrum according to claim 1 or 2 covering the overall length of a rail, and carrying out fitting to the centrum of each rail in the joint of the rail of the pair laid in the die-length direction. While the rail for railroads with which the centrum into which the coolant is sent was formed in the interior along the die-length direction is equipped with the orbit for railroads of this invention according to claim 4 at two or more places estranged in the die-length direction of this rail It is characterized by being prepared between the feeding-and-discarding liquid tubes made open for free passage to said centrum, and these feeding-and-discarding liquid tubes, and forming the cooling system equipped with the cooling pump which sends the coolant into said centrum. The orbit for railroads of this invention according to claim 5 is characterized by preparing the heat exchanger to which said cooling system according to claim 4 constitutes the closed circuit of said coolant with said rail, and cools said coolant in the middle of this closed circuit. The orbit for railroads of this invention according to claim 6 is

characterized by preparing the connection member which joins the rail of these pairs together while it blockades the edge of the centrum of each of said rail by preparing said centrum according to claim 4 or 5 covering the overall length of a rail, and carrying out fitting to the centrum of each rail in the joint of the rail of the pair laid in the die-length direction.

[0010]

[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained based on drawing 1 thru/or drawing 4 . In addition, about the part which is common in drawing 5 and drawing 6 , explanation is simplified during the following explanation using the same sign.

[0011] First, if the rail for railroads concerning this operation gestalt is explained based on drawing 1 , this rail 10 for railroads is a rail for railroads which guides [ which guides and direct-supports ] the wheel of a rail car, shows the flanged rail in this operation gestalt, and has basic composition in which the centrum 11 by which the coolant is sent into the interior was formed along the die-length direction.

[0012] Said centrum 11 is formed so that the abbreviation pars intermedia of a pars basilaris ossis occipitalis may be reached [ from the abbreviation center section of the head of the rail 10 for railroads ] through an abdomen.

[0013] This rail 10 for railroads constitutes the orbit 17 for railroads as shown in drawing 4 as usual by being fixed to two or more \*\*\*\*\* 4 in parallel through a fastener 5 in the both-sides section of that pars basilaris ossis occipitalis.

[0014] And the rail 10 for railroads which has such a configuration can control the temperature rise mentioned above by passing coolant, such as water, to the centrum 11 currently formed in the interior, when the temperature of the rail 10 for railroads tends to rise in a flame world and axial stress tends to occur. Thus, since the axial stress produced in connection with a temperature rise by holding the temperature of the rail 10 for railroads below to predetermined temperature can also be stopped small, the second moment of area of the part and the rail 10 for railroads can be enlarged, and the flexural rigidity can be raised.

Furthermore, when the coolant exists in the interior of the rail 10 for railroads, the high frequency component of vibration of the rail 10 for railroads is absorbed by said coolant, and the noise-reduction effectiveness is heightened.

[0015] As the supply approach of said coolant, when a source can secure in near, the end section of said rail 10 for railroads is connected to said source here, for example. Or it connects with the coolant tank by which the coolant is supplied from said source. This coolant tank is located in a height rather than the other end of the rail 10 for railroads, the coolant is supplied to the centrum 11 of the rail 10 for railroads from the end section by natural fall, and it is possible to discharge this coolant from the other end of the rail 10 for railroads to the exterior.

[0016] In the joint of the rail 10 for railroads of the pair which, on the other hand, forms the centrum 11 mentioned above covering the overall length of the rail 10 for railroads as shown in drawing 2 , and is laid in the die-length direction While forming the connection member 13 which carries out fitting to the centrum 11 of each rail 10 for railroads and blockading the edge of the centrum 11 of each of said rail 10 for railroads by this connection member 13, it is also possible to join the rail 10 for railroads of these pairs together to shaft orientations.

[0017] By considering as such a configuration, the shaft orientations of the rail 10 for railroads can be made to be able to distribute the load which acts on the rail 10 for railroads, and subduction of the rail 10 for railroads in a joint can be further controlled by this.



[0018] Furthermore, as shown in drawing 4 , it is also possible to put side by side the cooling system 16 which supplies the coolant to this rail 10 for railroads using the rail 10 for railroads mentioned above, and to constitute the orbit 17 for railroads.

[0019] Namely, this orbit 17 for railroads connects the feeding-and-discarding liquid tube 18 made open for free passage to said centrum 11 by two or more places estranged in the die-length direction of the rail 10 for railroads of the pair laid in parallel. By these feeding-and-discarding liquid tubes 18 and the centrum 11 of said rail 10 for both railroads, the closed circuit of said coolant is formed and the heat exchanger 20 which cools the cooling pump 19 made to circulate through the coolant in the middle of and said coolant is formed. [ this closed circuit ]

[0020] Thus, if it is in the constituted orbit 17 for railroads, with the cooling pump 19, by making drawing 4 circulate through the coolant, as an arrow head shows, the coolant cooled in said heat exchanger 20 can be certainly sent into the rail 10 for railroads of a pair, and the cooling effect can be heightened.

[0021] And the thing of a configuration of that said heat exchanger 20 circulates compulsorily air cooling, a water cooling type, or air and water etc. is used. Moreover, it is also possible as a drive power source of said cooling pump 19 to use a solar battery.

[0022] In addition, many configurations, a dimension, etc. of each configuration member which were shown in said operation gestalt are an example, and can be variously changed based on a design demand etc. For example, it is also possible to prepare the closed circuit for cooling fluid flows shown in drawing 4 every rail 10 simple substance for railroads. Moreover, said rail 10 for railroads is equipped with the temperature sensor 21, and you may make it control actuation of said cooling system 16 by the control unit 22 based on the temperature information from this temperature sensor 21 to be shown in drawing 4 .

[0023] Furthermore, in said centrum 11, as shown in drawing 3 , it is also possible the height direction of the rail 10 for railroads or the cross direction, and to divide into the both directions and to form more than one further. When considering as such a configuration, it is necessary to form said connection member 13 each [ which was divided ] centrum 11 of every. And in order to prevent freezing of the coolant in said winter, it is also possible to use this coolant as the antifreezing solution.

[0024]

[Effect of the Invention] Since this invention is constituted as mentioned above, when the temperature of the rail for railroads tends to rise in a flame world and axial stress tends to occur, the temperature rise mentioned above by passing coolant, such as water, to the centrum currently formed in the interior can be controlled. Since the axial stress produced in connection with a temperature rise by holding the temperature of the rail for railroads below to predetermined temperature by this can be stopped small, the second moment of area of the part and the rail for railroads can be enlarged, and the flexural rigidity can be raised. Moreover, when the coolant exists in the interior of the rail for railroads, the high frequency component of vibration of the rail for railroads can be absorbed by said coolant, and the noise-reduction effectiveness can be heightened also from this point.

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TECHNICAL FIELD

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[Field of the Invention] Especially this invention relates to the rail for railroads and the orbit for railroads excellent in flexural rigidity with respect to the rail for railroads, and the orbit for railroads.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is drawing of longitudinal section in which showing the rail for railroads concerning this invention, and showing the condition of having laid 1 operation gestalt.

[Drawing 2] It is the side elevation which fractured the part which shows 1 operation gestalt of this invention and shows the joint structure of the rail for railroads.

[Drawing 3] It is drawing of longitudinal section showing other operation gestalten of this invention.

[Drawing 4] It is the outline top view showing 1 operation gestalt of the orbit for railroads concerning this invention.

[Drawing 5] It is drawing of longitudinal section showing the 1 conventional example.

[Drawing 6] It is a schematic diagram for explaining the behavior of the rail for railroads under the elevated temperature in the general orbit for railroads.

[Description of Notations]

- 1 Rail
  - 2 Base Course
  - 3 Ballast
  - 4 \*\*\*\*\*
  - 5 Fastener
  - 6 Orbit for Railroads
  - 10 Rail for Railroads
  - 11 Centrum
  - 13 Connection Member
  - 16 Cooling System
  - 17 Orbit for Railroads
  - 18 Feeding-and-Discarding Liquid Tube
  - 19 Cooling Pump
  - 20 Heat Exchanger
  - 21 Temperature Sensor
  - 22 Control Unit
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## CLAIMS

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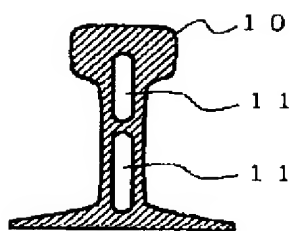
[Claim(s)]

[Claim 1] The rail for railroads which is a rail for railroads which guides [ which guides and direct-supports ] the wheel of a rail car, and is characterized by forming the centrum by which the coolant is sent into the interior along the die-length direction.

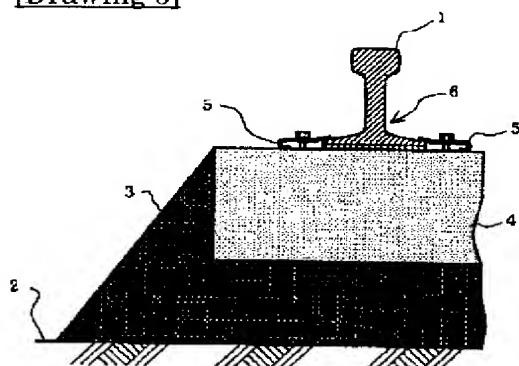
[Claim 2] The rail for railroads according to claim 1 characterized by for said centrum setting spacing in the direction of a field which intersects

[Claim 6] The orbit for railroads according to claim 4 or 5 characterized by preparing said centrum covering the overall length of a rail, and preparing the connection member which joins the rail of these pairs together while blockading the edge of the centrum of each of said rail by carrying out fitting to the centrum of each rail in the joint of the rail of the pair laid in the die-length direction.

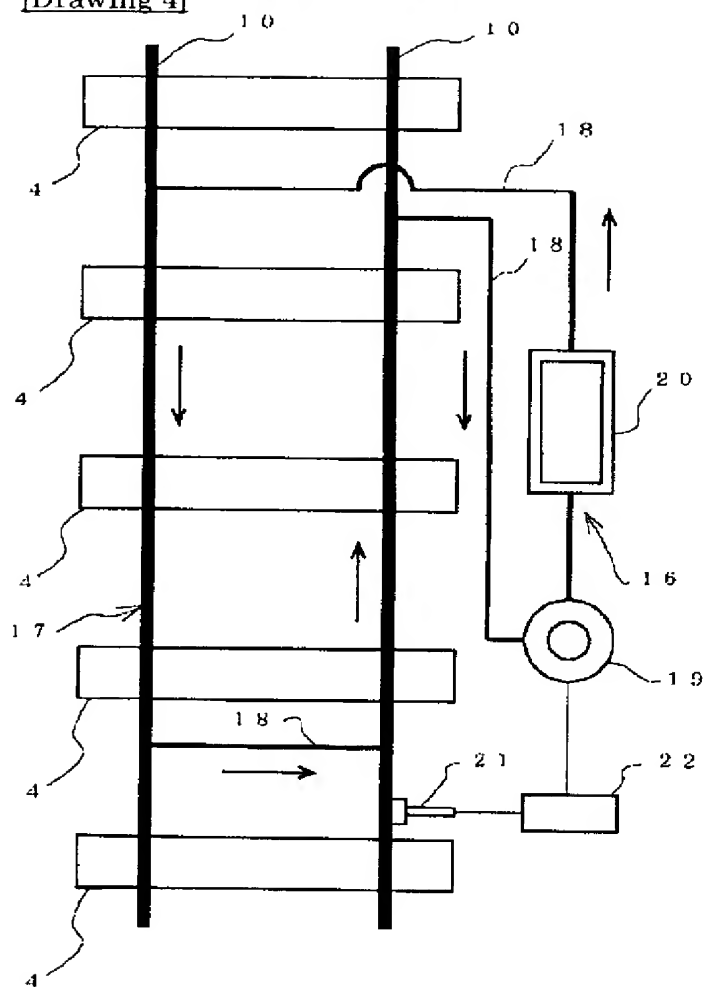
[Drawing 3]



[Drawing 5]



[Drawing 4]



[Drawing 6]

